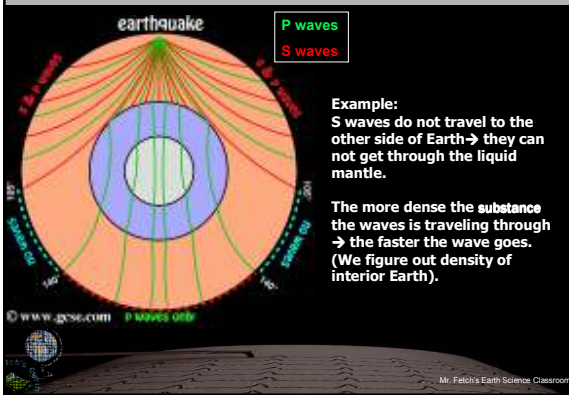


Seismic Waves

1. We have never “seen” the **inside of Earth**, but waves help show us what is there.
2. The idea that Earth is made of **different layers** and different types of material was supported by studying the motion of seismic waves.
3. Remember, **P waves** pass through **solids and liquids**.
4. **S waves** pass only through **solids**.



Waves and Earth's Interior



Example:
S waves do not travel to the other side of Earth → they can not get through the liquid mantle.

The more dense the substance the waves is traveling through → the faster the wave goes. (We figure out density of interior Earth).

Measuring Earthquakes

Scientists have two ways of measuring earthquakes:

- **Richter Scale**
- **Mercalli Scale**



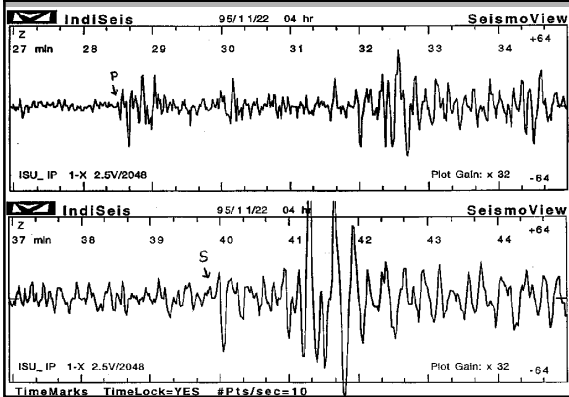
Measuring Earthquakes

Richter Scale

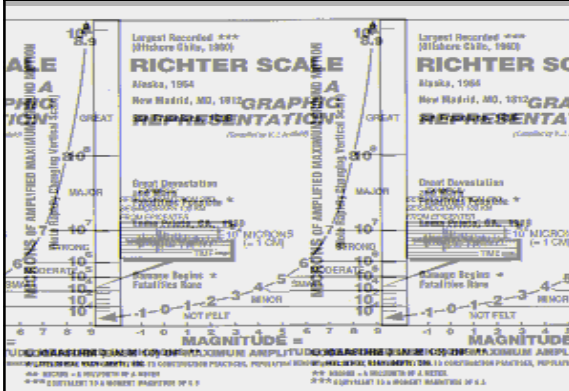
1. A scale that measures the **magnitude** of the largest **wave** recorded on a seismogram.
2. The wave amplitude increases by **10 for every 1** magnitude increase on the scale.
3. Example: A **Mag (3)** earthquake has waves **10 times bigger** than a **Mag (2)**.
4. This scale is the most common used to report the strength of an earthquake.
5. The higher the magnitude of the wave, the **stronger** the earthquake.



Measuring Earthquakes



Measuring Earthquakes



Measuring Earthquakes

Understanding the Richter Scale		
Richter Magnitude	Feels Like KG of TNT	Extra Information
0-1	0.6-20 kilograms of dynamite	We can not feel these
2	600 kilograms of dynamite	Smallest quake people can normally feel
3	20,000 kilograms of dynamite	People near the epicenter feel this quake
4	60,000 kilograms of dynamite	This will cause damage around the epicenter. It is the same as a small atomic bomb
5	20,000,000 kilograms of dynamite	Damage done to weak buildings in the area of the epicenter
6	60,000,000 kilograms of dynamite	Can cause great damage around the epicenter
7	20 billion kilograms of dynamite	Creates enough energy to heat New York City for one year. Can be detected all over the world. Causes serious damage
8	20 billion kilograms of dynamite	Causes death and major destruction. Destroyed San Francisco in 1906
9	20 trillion kilograms of dynamite	Rare, but would cause unbelievable damage!

Measuring Earthquakes

Mercalli Scale

1. A scale that measures the **amount of damage** that occurs after an earthquake.
2. Not very common.



Hazards from Earthquakes

1. **FIRE:** gas lines breaking.



Hazards from Earthquakes

2. **Liquefaction**: when water-filled **soils** act like "flowing **liquids**" and **collapse** due to the shaking of the ground.

- The buildings **float** off their foundation and collapse.
- The soils shake and **flow** so much that they act like liquids rather than solids.



Mr. Feltch's Earth Science Classroom

Hazards from Earthquakes



Hazards from Earthquakes

3. **Tsunamis**: **waves** produced from **underwater** earthquakes (NOT A TIDAL WAVE).

- Movement along a **fault** underwater causes vertical **displacement of water** (hanging wall moves up or down).
- The energy released **pushes water** upward forming a large wave.
- While at sea, the wave is not really that noticeable.
- As it approaches the shallow water near the coast, the water is **forced upward** forming a huge **wave** > 90 feet tall at times.



Mr. Feltch's Earth Science Classroom

Hazards from Earthquakes

Deadly walls of water

Tsunami waves travel very fast on the open ocean, but their destructive power comes from the towering heights they attain as they approach the coast.

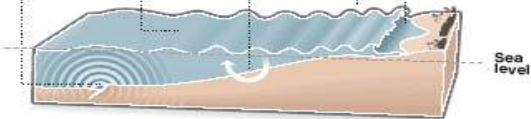
Seismic event or displacement sends shock waves outward.

Initial waves travel very fast, but are only a few feet in height.

Waves travel through shallower depths as they approach the coast.

As they approach land, the waves decrease in speed while increasing in height.

Tsunami waves hit shores with deadly force, depositing water and debris.



Hazards from Earthquakes